



SECTION 405

ROAD MIX BITUMINOUS PAVEMENT

405.1 Description. This work shall consist of constructing one or more courses of road mix bituminous pavement on a prepared base or road surface in accordance with these specifications and in conformity with the lines, grades, thicknesses and typical cross sections shown on the plans or established by the engineer. Approved plant mix methods may also be used.

405.2 Material. All material shall conform to Division 1000, Materials Details, and specifically as follows:

Item	Section
Graded Aggregate for Bituminous Surface	1004
Type MC Liquid Asphalt	1015

The grade of liquid asphalt and the grade of aggregate will be specified in the contract. The liquid asphalt may be changed one grade by the engineer during construction at no change in unit price. The liquid asphalt and mineral aggregate shall result in a mixture which will be durable and retain satisfactory cohesion and stability in the presence of moisture. Chemical additions, approved by the engineer, may be made to the liquid asphalt or to the mixture.

405.2.1 Commercial Mixture. The use of a commercial mixture will be considered by the engineer on contracts requiring not more than 700 cubic yards (550 m³) or 1000 tons (1000 Mg) of aggregate for road mix bituminous pavement. The contractor shall, at least seven days prior to the desired time of use, furnish a statement setting out the source and characteristics of the mixture the contractor proposes to furnish. The statement shall include (1) the types and sources of aggregates, percentage of each and combined gradation, (2) the percent and grade of asphalt, and (3) the mixing time and range of mixture temperature. The plant shall be designed and operated to produce a uniform, thoroughly mixed material free from segregation. If the proposed mixture and plant are approved by the engineer, the component material and the mixture delivered will be accepted or rejected by visual inspection. The supplier shall furnish a certification in triplicate that the material and mixture are in conformance with the contractor's approved proposal. The material shall be placed and compacted in accordance with the requirements specified herein.

405.3 Equipment. The equipment used by the contractor shall include scarifying, mixing, spreading, finishing and compacting equipment, a bituminous distributor and equipment for heating liquid asphalt.

405.3.1 Heating. Equipment for heating liquid asphalt in tanks, railroad cars, trucks and distributors shall meet the approval of the engineer and shall be capable of heating the material to the required temperature without the introduction of moisture, localized overheating or otherwise changing the characteristics of the material.

405.3.2 Distributor. The distributor shall be so designed, equipped, maintained and operated that liquid asphalt at even heat may be applied uniformly on variable widths of surface up to 15 feet (4.5 m) at readily determined and controlled rates from 0.02 to 1.00 gallon per square

yard (0.1 to 4.6 L/m²), with uniform pressure, and with an allowable variation from any specified rate not to exceed 0.02 gallon per square yard (0.1 L/m²). Distributor equipment shall include a tachometer, pressure gauges, a calibrated tank and a thermometer for measuring temperatures of tank contents. Distributors shall be equipped with a power unit for the pump, and full circulation spray bars adjustable laterally and vertically. The calibration of all distributors must be approved by the engineer, and the contractor shall furnish all equipment, material and assistance necessary if calibration is required.

405.3.3 Miscellaneous Equipment. Equipment which will break, rut, score or distort the surface to remain in place, or being placed, as well as blade graders which cause corrugations will not be permitted. A power driven sweeper and a windrow evenner which will provide a uniform windrow of proper size will be required. Other approved equipment shall be used as required for mixing.

405.3.4 Rollers. Approved pneumatic tire rollers weighing (having a mass of) not less than 10 tons (9 Mg) may be used; however, final rolling shall be done by a self-propelled steel wheel roller weighing (having a mass of) not less than 10 tons (9 Mg). The roller wheels shall be equipped with scrapers and a system for moistening each wheel or roll to prevent sticking of bituminous material.

405.3.5 Mixing Plants. Traveling or stationary mixing plants having a capacity of not less than 300 cubic yards (200 m³) of mixed material per 8-hour day, or other equipment of proven performance may be used by the contractor in lieu of the specified equipment if approved. Plant equipment shall include a thermometer indicating the temperature of the liquid asphalt at the time of mixing and any necessary instruments for determining the quantity of liquid asphalt entering the mix at any given time. Both the aggregate and asphalt feed controls shall be within easy reach of the operator controlling mixing.

405.4 Construction Requirements.

405.4.1 Weather Limitations. Bituminous mixtures shall not be placed (1) when either the air temperature or the temperature of the surface on which the mixture is to be placed is below 40 F (5 C), (2) on any wet or frozen surface, or (3) when weather conditions prevent the proper handling or finishing of the mixture. Temperatures are to be obtained in accordance with MoDOT Test Method T20.

405.4.2 Preparation and Maintenance of Base. If a prime coat is required, it shall be left undisturbed not less than 24 hours following application. The contractor shall maintain the primed surface until the road mix bituminous pavement has been placed. This maintenance shall include the patching of any breaks in the primed surface with additional bituminous material. If a tack coat is required, it shall be applied only as far in advance of the placing of the mixture as is necessary to obtain the proper condition of tackiness. Any breaks in the tack coat shall be repaired. Maintenance of base shall be at the contractor's expense.

405.4.3 Placing Aggregates. Aggregates shall be deposited on the roadbed and bladed into a uniform windrow on one shoulder on tangents, and on the high shoulder of curves throughout the project, at the rate specified in the contract or as directed by the engineer.

405.4.3.1 Immediately before the application of asphalt, the windrow shall be placed adjacent to and on one side of the centerline and all loose material swept into the windrow by using a power driven sweeper and evened to the required size by the use of a windrow evenner. If it becomes necessary to spread a properly evened windrow of aggregate for drying, it shall be windrowed, and evened if required, before application of the asphalt.

405.4.3.2 If mixing is to be done with a traveling plant, the following method may be used in lieu of the evening operation. The first 1000 linear feet (300 m) shall be evened as outlined above and the aggregate feed of the machine shall be calibrated. On the remainder of the project, the evening operation may be superficial, with the aggregate feed control being permitted to serve in lieu of evening. If this method is used, the aggregate feed control shall not be varied by more than 5 percent after it has been calibrated and set by the engineer. The contractor shall keep sufficient aggregate in the windrow to supply the aggregate feed, and shall haul material into the windrow or haul excess ahead when necessary.

405.4.4 Application of Liquid Asphalt. No asphalt shall be applied to or mixed with the aggregate until the aggregate has been surface dried. To receive each application of asphalt, the properly evened and dried windrow shall be spread to about a 12-foot (3.5 m) width. Liquid asphalt shall be heated at the time of application to a temperature specified by the engineer in accordance with the limits provided in [Sec 1015](#). The asphalt shall be applied by a distributor with a spray bar approximately 10 feet (3 m) long. The application shall be made in not less than two increments, the first of which shall not exceed one half the total quantity required. Between these several treatments the material shall be mixed, windrowed and respread at least once. Suitable mixing equipment shall follow immediately behind the distributor giving the mixture a preliminary manipulation.

405.4.5 Mixing. After the last application of asphalt, and following partial mixing, the entire amount (mass) of asphalt and aggregate shall be windrowed on the road surface and then mixed, by blading the mixture from side to side of the road, or by manipulations producing equivalent results, until the mixture is homogeneous and uniform in color. During the mixing operations, care shall be taken to avoid cutting into the underlying course or contaminating the mixture with earth or other extraneous matter. When directed, the mixing process shall be confined to part of the width or area of the road to allow traffic to pass. The material shall be mixed in sections not less than 1/2 mile (1 km) long unless otherwise permitted by the engineer.

405.4.5.1 If, in the judgment of the engineer, the mixture does not contain the proper quantity of asphalt after mixing, more asphalt or aggregate shall be added and mixing continued until a satisfactory mixture is attained. If the addition of asphalt or aggregate and subsequent mixing are the result of a change in the engineer's directions, such additional manipulation will be paid for as change in the work in accordance with [Sec 104.3](#).

405.4.5.2 If an approved traveling mixing plant is used, the asphalt shall be added during the mixing operation in the quantity specified by the engineer. Additional manipulation may be required. If, in the judgment of the engineer, the mixing in the traveling plant is satisfactorily performed and the mixed windrow does not contain the proper quantity of asphalt, more asphalt or aggregate shall be added according to his directions, and the windrow shall be mixed until a satisfactory mixture is attained. If the addition of asphalt or aggregate and subsequent mixing are the result of a change in the engineer's directions, the additional manipulation will be paid for as change in the work in accordance with [Sec 104.3](#).

405.4.5.3 After the aggregate and asphalt have been mixed as required, they shall be windrowed on one side of, and adjacent to the centerline of the road. If the windrow is not uniform in size, it shall be made so by shifting a portion of the material. All material to which asphalt has been applied shall be mixed and windrowed the same day the asphalt is added. Should rain occur during the mixing, the mixture shall be windrowed immediately and shall not be disturbed until the roadbed and outer layer of the windrow are dry.

405.4.6 Spreading, Compacting and Finishing. Laying a tack coat of the same grade of asphalt as the binder may be required by the engineer after mixing is completed. The width of the completed tack coat shall be the width specified for the finished surface course and shall

be applied to only one half the width of the base at a time. As the tack coat is applied, the windrow of asphalt-aggregate mixture shall be split and one half of it shall be spread over the tack coat by a self-propelled, pneumatic tire blade grader or a mechanical spreader of approved type. In spreading from the windrow, care shall be taken to avoid cutting into the underlying base.

405.4.6.1 The other one half of the windrow shall be bladed across the centerline to permit the tack coat to be applied to the opposite one half of the base, after which the remaining mixture shall be spread over the tack coat. The spreading of the material over the tack coat shall be done so that a small windrow will be formed, the outer edge of which coincides with the edge of the finished surface. Final spreading and shaping shall proceed with the small windrows being bladed and spread from the edges toward the center in such manner that the finished surface will be smooth and of uniform texture. Care shall be taken to smooth out the junction of successive spreads. The contractor shall adjust the surface of the base at bridge ends so that the new surface will have a uniform grade connection and a smooth riding surface.

405.4.6.2 All mixed material shall be spread within 24 hours after it is mixed, unless the tack has not cured, the base is wet or the mixed material contains an excess of moisture. No mixture shall be spread after dark. If the material becomes wet after spreading but before being rolled, the material shall be thoroughly dried and relaid as soon as weather permits.

405.4.6.3 Immediately after the material has been spread to a uniform across section, the surface shall be rolled longitudinally at a speed not in excess of 3 miles per hour (5 km/h). Rolling shall start at the edges and shall progress toward the center, overlapping on successive trips by not less than 6 inches (150 mm). The mixture shall be thoroughly compacted by not less than three complete coverages over the entire area with the final passes of the roller being made along the edges of the pavement.

405.4.6.4 Prior to acceptance, the contractor shall maintain the bituminous surface, smoothing out all ruts and irregularities, patching any raveled areas and correcting any other defects, as directed by the engineer. If, after spreading and at any time before acceptance, there are any sections which require more bituminous material, the contractor shall distribute a light application on those sections as directed, payment for which shall be fully covered by the contract unit price for liquid asphalt.

405.5 Method of Measurement.

405.5.1 Measurement of liquid asphalt, to the nearest 10 gallons (50 L), will be made as specified in [Sec 1015](#).

405.5.2 Measurement of aggregate will be made in accordance with the applicable requirements of [Sec 310.4](#).

405.5.3 Measurement of processing will be made to the nearest 0.01 mile (0.1 km) along the centerline of the pavement, or each pavement of a divided highway, regardless of the width of the completed surface.

405.5.4 If specified in the contract as a complete product in place, road mix bituminous pavement will be measured to the nearest square yard (square meter).

405.5.5 If the contractor elects to substitute a commercial mixture in accordance with [Sec 405.2.1](#), payment will be based on contract quantities unless an authorized revision has been made in the area to be surfaced.

405.6 Basis of Payment. The accepted quantities of road mix bituminous pavement will be paid for at the unit price for each of the pay items included in the contract.